

Preliminary DRAFT

Attachment 1

Table of Drivers and Stressors in the Bay-Delta Ecosystems [Notes include both changes in state of the ecosystem as well as examples of impacts.]

Type*	Driver (D) or Stressor (S)	Notes
1	Globally Determined Drivers/Stressors	
	D Climate change	
	S Reduced inflow & outflow	Possibly lower water yield
	S Changed hydrograph	Altered seasonal patterns (earlier, smaller freshest)
	S Higher temperatures	Seasonal temperature variation; altered phenology (e.g., timing mismatch between predators & prey, flower and pollinator); species and biogeochemical processes impacted by temperature;
	S Sea level rise	Salinity intrusion, levee breaches, altered rates of erosion and deposition
	S Changing ocean conditions	Many Delta species spend part of their lives living or feeding in the ocean
	D Earthquakes	Levee and highway damage
	D Population growth	Places increasing pressure on land and water resources
	D California economy	Patterns of development, agriculture, recreation are driven by economics
2	Legacy Drivers/Stressors	
	S Habitat loss and alteration	Loss or reduction of seasonal and tidal wetlands, riparian habitats, gallery forests and native grasslands; simplified system of leveed agricultural islands separated by deep channels with leveed shorelines; small, unconnected fragments of natural habitat; channels unconnected to floodplain; uplands less connected to Delta; channels dredged, interconnected, and simplified; terrestrial diversity reduced; impacts include: changing competition and predation, loss of access to breeding sites
	S Changed pattern of flow	Channel simplification and interconnection changed flow velocity and pattern; infrequent floodplain inundation; impacts include: migration barriers, altered migration corridors, improved water conveyance to south Delta, salt entrainment affects domestic water supply, loss of access to breeding sites, greater tidal excursion and salt penetration into Delta
	S Methyl-mercury from released mercury	Changing Delta conditions can affect the methylation of mercury stored in sediments; impacts include mercury bioaccumulation in the foodweb
	S Selenium	Past practices resulting in residual toxins in the food web

Type*	Driver (D) or Stressor (S)	Notes
	S Subsidence	Loss of peat soils in islands; impacts include increased risk of levee breaks with loss of structures and habitat
	S Changing sediment loads	Sediment delivery increased with European colonization and is now declining; impacts include: turbidity declines, altered erosion and deposition, SAV expansion, smelt distribution
	S Artificial levees	Isolated land and water ecosystems & made possible the development of the Delta's cultural & economic character
	D Water management infrastructure	Increases reliability of water delivery; habitat loss; altered migration corridors
	S Levee breaks	Permanent flooding of multiple W islands would likely raise salinity in the S Delta; native fish may not use deeply flooded islands
	D Upstream dams	Loss of access to breeding sites; existence and operation affect virtually every aspect of Delta environment, society and economy
	D Federal-state agricultural policies	Ag subsidies affect land use and habitation patterns
	D Development, zoning, building codes	Effects land use, lifestyle choices & many other human decisions affecting the Delta
	S Invasive species	Low prey; changed food web; changing competition; higher predation; agricultural pests
3	Anticipated Drivers/Stressors	
	S Subsidence	Loss of peat soils in islands; impacts include increased risk of levee breaks with loss of structures and habitat
	D Landscape change	Delta's habitat mosaic is constantly changing as human land and water use evolves
	D Urban expansion	Affects the Delta in many ways that threaten native species and ecosystems, water quality and demand, unique Delta attributes
	D Upstream land use	Affects the quantity and quality of water entering the Delta, sediment load, habitat for species migrating through Delta
	D Upstream dams	Existence and operation affect virtually every aspect of Delta environment, society and economy
	D Lifestyle choices	Decisions about where and how to live affect species, habitats, water demand
	D Urban-rural migration patterns	Dominant human migration patterns are rural to urban and inland to coastal
	S Invasive species	Low prey; changed food web; changing competition; higher predation;
4	Current Drivers/Stressors	
	S Changed hydrograph; reduced inflow and outflow	Upstream water withdrawals; water project and in-Delta withdrawals reduce flow through Delta; reduced seasonal flow variation; improved seasonal availability

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		of water for agriculture; impacts include: salinity intrusion, less salinity variability, seasonal temperature changes, water residence time more uniform, stranding, low DO and thermal migration barriers
	S Entrainment at pumps & other diversions	Effect of OMR flows on fish movement and water supply; in-Delta withdrawals for agriculture, domestic water, power plants
	S More nitrate, ammonium and less phosphorus	Excess nutrients from agriculture and domestic waste; altered N/P ratios; impacts include: low DO, SAV expansion, <i>Microcystis</i> blooms, reduced phytoplankton production, can favor invasive species
	S Selenium release	Releases by agriculture and industry can be toxic through the food web
	S Pesticide release	Agriculture, industry, and residential use (pyrethroids & organophosphates of concern)
	S Other trace metals and toxics	Lead, chromium, copper, surfactants, endocrine mimics and disruptors introduced from agriculture, industry, domestic waste, and storm water
	S Dredging	Channel dredging mobilizes sediment & toxins; impacts benthic organisms
	S Legal harvest	Incidental take of threatened species
	S Illegal harvest	Illegal take of threatened species
	D Hatchery impacts	Alters genetic makeup affecting ability to perform in the wild & wild conspecifics with which they breed
	SD Federal-state agricultural policy	Ag subsidies affect land use and habitation patterns
	D Development, zoning, building codes	Effects land use, lifestyle choices & many other human decisions affecting the Delta

- * 1) Globally determined stressors—stressors, like the effects of climate change or population growth, which cannot be eliminated or mitigated within the purview of the Delta Plan. Management actions must adapt to the continued effects of these stressors in the Delta.
- 2) Legacy stressors—stressors that result from past actions in the Delta watershed that cannot be undone. These include stressors such as the continuing effects of sediment and mercury discharge during the gold mining era. Infrastructure that causes stress on the Delta and is not likely to be significantly altered, such as upstream dams and the network of levees, can also be treated as legacy stressors. Although these stressors cannot be eliminated, management actions can reduce their effects on the Delta.
- 3) Anticipated stressors—stressors that we can anticipate will result from present or future activities. These activities can be modified by The Delta Plan in such a way as to prevent or reduce the stressor or better adapt to the stressor.
- 4) Current stressors—stressors that result from ongoing activities, such as water management practices, agricultural practices, waste discharges, etc. Management actions can either change those practices, take steps to reduce their effects on the Delta, or both.